Idaho State Department of Agriculture
Division of Agricultural Resources

Southern Washington and Northern Payette Counties Alluvial Aquifer

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Introduction

The Idaho State Department of Agriculture (ISDA) developed the Regional Agricultural Ground Water Quality Monitoring Program to characterize degradation of ground water quality by contaminants leaching from agricultural sources. The ISDA currently is conducting monitoring at eleven regions in Idaho with plans to implement further testing in other areas (Figure 1). The objectives of the program are to (1) characterize ground water quality related to primarily nitrate and pesticides, (2) determine if legal pesticide use contributes to aquifer degradation, (3) relate data to agricultural land use practices, and (4) provide data to support Best Management Practices (BMP) and/or regulatory decision making and evaluation processes.

The ISDA Southern Washington and Northern Payette Counties Alluvial Aquifer regional monitoring project began in 1996 as a result of previous monitoring by the Idaho Department of Water Resources (IDWR) and Idaho Farm Bureau. Three water wells in the area, tested during the first round of IDWR's Statewide Ambient Ground Water Quality Monitoring Program, exceeded the Environmental Protection Agency Maximum Contaminant Level (MCL)[1] of 10 milligrams per liter (mg/L) for nitrate. (Neely and Crockett, 1999). To establish this regional monitoring project, the ISDA randomly selected domestic wells in the area and coordinated with homeowners to conduct ground water sampling.

Nutrients, common ions, and pesticides were evaluated during the first four years (1996-1999) of ISDA's testing. Laboratory results indicated that numerous domestic wells in the Southern Washington and Northern Payette Counties area had nitrate concentrations that exceeded 10 mg/L during the four-year period. Noticeable increases in year-to-year median nitrate concentrations also were evident. In addition, low level detections of various pesticides were found in sampled wells throughout the 1996 to 1999 testing period.

[1]MCLs represent the EPA health standard for drinking water.

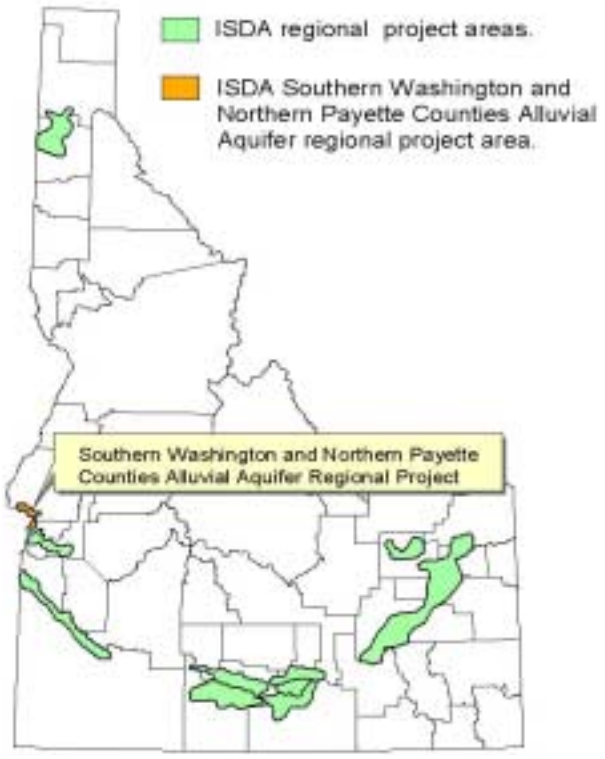

Figure 1. Location of Washington and Payette Counties Alluvial Aquifer regional project and other regional project areas.

The ISDA currently is working to advise residents and officials of the area to reduce further ground water contamination and possible health risks. Ground water monitoring will continue through the year 2000 to assist with these efforts.

Description of Project Area

The Southern Washington and Northern Payette Counties Alluvial Aquifer regional project encompasses an approximately 6 mile wide and 15 mile long area of irrigated agricultural land adjacent to the Snake River (Figures 1 and 2). Diversions from the Snake, Payette, and Weiser Rivers provide the main source of irriga-

tion water in the area. Local irrigation systems vary from the typical and historic practice of flood irrigation to more modern techniques of sprinkler irrigation. Major crops in the area include alfalfa, grain, beans, potatoes, sugar beets, corn, mint, onions, and seed crops (Steed et al., 1993).

Shallow ground water conditions exist across much of this area. Typically, depths to ground water are less than 100 feet. In many areas, depths to ground water are less than 20 feet. A potential source of recharge to this shallow system comes from applied irrigation waters. Shallow subsurface alluvial deposits (primarily gravels) conducive to leaching of contaminants underlie substantial portions of the southern Washington and northern Payette Counties area. Potential sources for nitrate leaching to ground water in the area include applied nitrogen-based fertilizers, septic systems, cattle manure, legume crops, and wastewater lagoons.

Results

Sampling results for the first four years of testing indicate nitrate and pesticide impacts have occurred to the shallow alluvial aquifer. Results are summarized and presented in the following sections.

Nitrate

Results of ground water sampling in the project area from 1996 to 1999 indicate increases in both median nitrate levels as well as the number of wells testing above the MCL for nitrate (Figure 2). In 1999, 18 or 41% of the wells sampled were over the MCL (health standard) of 10 mg/L for nitrate concentrations; a 13% increase from 1996 (Table 1). A maximum concentration of 25 mg/L nitrate was measured in sampled ground water for one well location. Median nitrate concentrations for 1999 were 8.0 mg/L; an approximate increase of 2 mg/L from the median concentration determined from 1996 testing results.

For all years tested, there are numerous detections of nitrate between 5.0 and 10 mg/L and over 10 mg/L (Table 1). Nitrate concentrations are most elevated in the area west of Weiser and between Weiser and Crystal within Washington County (Figure 2). The median nitrate concentration per year and the number of detections over 10 mg/L are of concern because of potential health risks. (Table 1). Five wells sampled in the northwestern most corner of Payette County tested below 5 mg/L for nitrate.

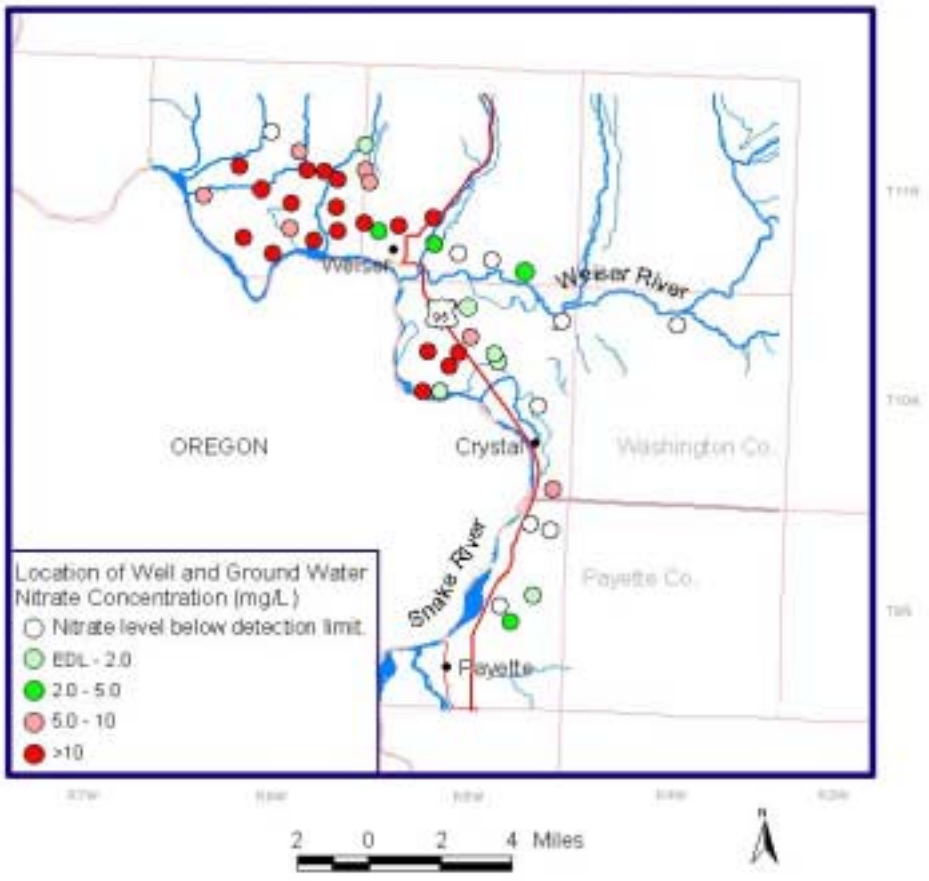

Figure 2. Locations of wells sampled by ISDA in Washington and Payette Counties, Spring 1999. Colors represent nitrate concentration measured in ground water from each well.

Pesticides

Samples were collected twice in 1996 and sent to the Washington Department of Ecology (WDOE) Laboratory in Manchester, Washington. Testing for pesticides was accomplished utilizing EPA Methods 1618 and 8085 with very low detection limits. In 1999, samples for all wells were sent to the University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho. Samples were tested for various pesticides utilizing EPA Methods 507, 508, 515.1, and 531.1.

Pesticides were detected frequently throughout the project area. However, detections were typically low in concentration. Testing of ground water samples collected during 1996 and 1997 detected the presence of atrazine desethyl, atrazine, simazine, prometon, bromacil, 2,4-D, metolachlor, metribuzin, dacthal, propazine, and hexazinone in order of most to least frequently detected (Table 2 and 3). All pesticide detections were below any health standard as set by the EPA or the state of Idaho.

In 1999, the two pesticides positively detected were atrazine (8) and dacthal (5) (Table 4). The high values for atrazine and dacthal were 0.12 micrograms per liter (µg/L) and 14 µg/L, respectively. Fewer detections occurred in 1999 versus 1996 and 1997 due to the higher

Table 1. Nitrate results for Southern Washington and Northern Payette Counties regional project, 1996 – 1999.

Concentration Range (mg/L)	Spring 1996 50 wells	Summer 1996 49 wells	Spring 1997 49 wells	Spring 1998 26 wells (Wells with > 5 mg/L in 1997)	Spring 1999 44 wells
< EDL (0.033)	10 (20%)	9 (18%)	11 (22%)	-	9 (20%)
EDL to < 2.0	6 (12%)	4 (8%)	6 (12%)	-	6 (14%)
2.0 to < 5.0	4 (8%)	6 (12%)	3 (6%)	2 (8%)	4 (9%)
5.0 to < 10	16 (32%)	13 (27%)	18 (41%)	9 (34%)	7 (16%)
> 10	14 (28%)	17 (35%)	12 (25%)	15 (58%)	18 (41%)
Median Value	6.6 mg/L	7.3 mg/L	6.5 mg/L	11 mg/L	8.0 mg/L
Maximum Value	23 mg/L	20 mg/L	22 mg/L	25 mg/L	25 mg/L

Table 2. Pesticide results for Southern Washington and Northern Payette Counties regional project, Spring 1996.

Pesticide Detects	Number Detects (50 wells)	Range (µg/L)	Health Standard (µg/L)
Atrazine	23	0.0070 - 0.57	3 (MCL)*
Atrazine Desethyl	26	0.0040 - 0.57	35 (RfD)**
Bromacil	3	0.086 - 1.7	100 (RfD)**
Dacthal	1	0.020	100 (RfD)**
Metolachlor	1	0.030	100 (HAL)***
Metribuzin	1	0.0090	13 (RfD)**
Prometon	1	0.042	15 (RfD)**
Simazine	6	0.0030 - 0.043	4 (MCL)*

Table 3. Pesticide results for Southern Washington and Northern Payette Counties regional project, Spring 1997.

Pesticide Detects	Number Detects (49 wells)	Range (µg/L)	Health Standard (µg/L)
Atrazine	24	0.0030 - 0.48	3 (MCL)*
Atrazine Desethyl	25	0.0060 - 0.13	35 (RfD)**
Bromacil	1	0.12	100 (RfD)**
Hexazinone	1	0.0050	200 (MCL)*
Prometon	5	0.0040 - 0.14	15 (RfD)**
Propazine	1	0.0070	20 (RfD)**
Simazine	3	0.0040 - 0.0070	4 (MCL)*
2,4-D	2	0.010 - 0.026	70 (MCL)*

*MCL - EPA Maximum Containment Level
** RfD - EPA Reference Dose for 10 kg Child
***HAL - EPA Health Advisory Level

Table 4. Pesticide results for Southern Washington and Northern Payette Counties regional project, Spring 1999.

Pesticide Detects	Number Detects (44 wells)	Range (µg/L)	Health Standard (µg/L)
Atrazine	8	0.038 - 0.12	3 (MCL)*
Dacthal	5	0.50 - 14	100 (RfD)**

environmental detection limits utilized by the UIASL.

Conclusions

Ground water within the shallow alluvial aquifer of the project area is being impacted from nitrates and pesticides. Because of high nitrate concentrations and the large number of nitrate detections, contamination of ground water by nitrate is of concern. Although concentrations are generally low, the frequency of pesticide detections also is of concern, in part, because of multiple pesticide detections per well. Health risks associated with consuming low level concentrations of more than one pesticide compound is poorly understood.

Median ground water nitrate levels have increased nearly 2.0 mg/L from 1996 to 1999. In 1999, 57% of the 44 wells sampled were over 5 mg/L for nitrate. A total of 18 wells or 41% exceeded the EPA drinking water standard of 10 mg/L. Areas having highest nitrate concentrations are west and south of Weiser. The majority of wells sampled are less than 100 feet deep.

Although the number of pesticide detections apparently have decreased from 1996 to 1999, this is likely a function of the laboratory detection methods used. In both 1996 and 1997, over half of the wells tested in the project area had positive pesticide detections. Numerous types of pesticides were detected with Atrazine and Atrazine Desethyl detections the most common. In 1999, the number of detections were down with Atrazine and Dacthal being the only two pesticides detected.

Agricultural practices are likely a contributor to nitrate and pesticide detections in the ground water of this project area. Testing results indicate nitrate and pesticide impacts to shallow ground water of the project area are widespread. This is common in sparsely populated rural areas that have high agrichemical input agriculture with mostly furrow irrigation overlying a shallow alluvial aquifer. Leaching of applied commercial fertilizers is probably a major cause of nitrate entering the ground water.

Recommendations

To determine if current farming practices are contributing to ground water degradation and to locate other potential contaminant sources, the ISDA recommends continued and more intensive monitoring in the project area.

Testing should include, but not be limited to:

- Continued ground water monitoring for nutrients, common ions, and pesticides.
- Isotope testing to determine possible nitrate sources and relative ages of ground water.
- Soil sampling and soil pore water sampling.

The ISDA further recommends that measures to reduce nitrate and pesticide impacts on ground water be addressed and implemented. The ISDA recommends that:

- Growers and agrichemical professionals conduct nutrient, pesticide, and irrigation water management evaluations.
- Producers follow the Idaho Agricultural Pollution Abatement Plan and Natural Resources Conservation Service Nutrient Management Standard.
- Producers and agrichemical dealers evaluate their storage, mixing, loading, rinsing, containment, and disposal practices.
- Homeowners assess lawn and garden practices, especially near wellheads.
- Local residents assess animal waste management practices.
- State and local agencies assess impacts from private septic systems.
- Home and garden retail stores establish outreach programs to illustrate proper application and management of nutrients and pesticides.
- Responsible parties assess current pesticide application practices to non-crop areas (example: roadsides, railroad areas, etc.).

The ISDA recommends that the Weiser and Payette Soil and Water Conservation Districts lead a response process to create a plan of action to address these ground water contamination issues. The soil and water conservation districts should work with local agrichemical professionals, landowners, and agencies to implement this process and seek funding to support these efforts. The ISDA will support these local partners in seeking funding and implementing a comprehensive program.

References

Neely, K. W., and Crockett, J. K., 1999. Nitrate in Idaho's ground water: Idaho Department of Water Resources Technical Results Summary No. 1, 12 p.

Steed, R., Winter, G., and Cardwell J., 1993. Idaho Snake-Payette River hydrologic unit ground water quality assessment west central Idaho: Idaho